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FOUR NEW TAXA OF FERNS FROM WYNAD, SOUTH INDIA

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ABSTRACT

Four new taxa of ferns, *Adiantum ramyam* (Adiantaceae), *Tectaria macrocarpa, T. periya* (Dryopteridaceae) and *Sphaerostephanos wynadensis* (Thelypteridaceae) are reported and described from Wynad, South India.

INTRODUCTION

During the course of a study of pteridophyte flora of Malabar area of Kerala (South India) several new and interesting taxa were collected, among which four from Wynad are described here. Wynad is a continuation of Deccan Plateau of South India jutting westwards into the narrow coastal plains of West Coast and separated from the rest of the plateau by the Western Ghats mountain range; it ends abruptly on the western side, the steep western slopes clothed by dense tropical forest. It lies between 75° 50′ and 76° 30′ E. longitude and 11° 10′ and 11° 50′ N. latitude. On an average it is 750 - 850 m above m.s.l., with an annual temperature range of 25-35°C and rainfall *ca* 3600 mm, mostly restricted to the period May-August; dry season extends from December to March. Ruggedness of terrain and consequent inaccessibility coupled with prevalence of malaria and dangerous wild life made botanical explorations difficult, leaving Wynad botanically little known. Pressed by poverty and population explosion, land-hungry peasants braved the dangers and tamed Wynad during the past 40 years, destroying forests and building townships, roads, communication networks and cashcrop plantations, so much so that today very little is left of the original flora and what is left stands in danger of being wiped out soon. Small patches of highly depleted forest still remain here and there, but unchecked encroachment takes place at a fast rate by peasants for cashcrop cultivation and by the Government for development projects.

TAXONOMY

1. **Adiantum ramyam** Nayar et Geevarghese sp. nov.

Rhizome breve erectum; stipes niger, 20-25 cm longus; lamina ovato-lanceolata, 60-90 cm longa, *ca* 25 cm lata, tripinnata; in base per secondarum pinnarum primario ramo rachis insitarum, simplex, subdeltoides, involvens rachiori; propellas 3-5 pares pinnatae cum tertiaris pinnis dimidiatis, 5-7 × 2-5 mm in dimensione, habentibus exteriorem margineum leviter incisum et ultimum margine vale dentarum; pinnis terminalibus subdeltoides cum cuneatis, *ca* 20 mm longis, 17 mm latis et cum margine superiore alte incisum; sori rotundis, 1.5 mm ex traverso cum duoribus veniculis; sporae *ca* 43 × 50 *u* in magnitudine, granulosa ornata.

Type: K 11637 collected at Vellamunda (Wynad) on 14-2-1982 by B. K. Nayar & P. V. Madhusudanan, and deposited at the Central National Herbarium, Calcutta (CAL). Duplicate deposited at the Calicut University Herbarium (CALI).

The specific epithet is derived from Sanskrit, "Ramyam" — elegant.

A. ramyam is a large fern forming extensive colonies (fronds obliquely hanging downwards) on semi-shaded steep earth cuttings. Rhizome erect, hypogeal, short, dictyostelic, 10-15 mm thick, having thick-walled ground tissue, and clothed densely by uniformly dark-brown lanceolate paleae which are 4-5 × 1 mm, having faintly cordate base and crowned by a thick walled acicular cell which may be hook-like. Fronds spirally arranged, tufted, spreading, with the stipe 20-25 cm long, 2 mm thick, blackish, glossy, adaxially grooved, densely paleaceous at base and supplied by a solitary channel-shaped vascular strand. Lamina flaccid, ovate-lanceolate, 60-90 × up to 25 cm, tripinnate; rachis black, glossy, ± zigzag in upper half and bearing several alternate primary pinnae of which the larger ones are 15 × 3-4 cm, ovate to oblong-ovate and crowned by a terminal ultimate pinna; secondary rachis black, ± zigzag, bearing 8-10 pairs of secondary pinnae of which the basalmost pair is simple, larger than other ultimate pinnae and close to primary rachis (appearing like stipules on the rachis); 3-5 pairs of secondary pinnae next to basal pair are pinnate (up to 4 cm) and those above them progressively less dissected till the anteriormost are simple; tertiary pinnae 1-3 pairs followed by a larger, lobed, often subdeltoid terminal pinna; ultimate pinnae varying in shape and size depending on position, 5-15 × 4-10 mm (tertiary ultimate pinnae 15 × 10 mm) having slender stalk (2-3 mm) and with outer margin lobed into 3-6 large semicircular primary lobes (but smaller ones dimidiate, either sessile or subsessile) having oblique base and nearly semicircular shallowly-lobed outer margin; primary lobes shallowly lobed again twice so that ultimate margin is toothed (teeth rounded); terminal pinna of primary and secondary pinnae subdeltoid with broadly cuneate oblique base, 20 × 17 mm in size and with the outer margin deeply lobed into subspatulate lobes. Lamina soft, membraneous and glabrous on both surfaces. Sori 1 or 2 per ultimate lobe of pinnae, circular, 1.5 mm across and forming a narrow notch on outer margin. Annulus 16-18 cells long; paraphyses absent. Spores tetrahedral, 43 × 50 μ, subcircular in polar view; exine dark brown, 2 μ thick, smooth and covered by a skin-like dark-brown prominently granulose perine.

A. ramyam is collected from only Vellamunda and adjacent Kunjom areas of Wynad. It forms large patches on steep earth cuttings on sides of Mananthawady road which crosses the area.

2. **Tectaria macrocarpa** (Bedd.) Nayar et Geevarghese stat. nov. *Aspidium polymorphum* var. *macrocarpum* Bedd., Ferns South India, 40, t. 117, 1864.

Aspidium polymorphum Wall. in Bedd. Handb. Ferns Br. India, 1883 (p.p.).

A medium-sized terrestrial fern growing as isolated plants in semi-exposed to shaded regions of Ghat forests on rather dry soil. Rhizome short creeping, epigeal, branched, 10-15 mm thick, up to 20 cm long, greenish when cut, dictyostelic (many slender meristeles separated by wide gaps), having many slender black sclerenchyma strands in ground tissue, and bearing basally-attached narrowly lanceolate paleae which are dark-brown, 7-10 × 1.0-1.5 mm, tapered upwards to a uniseriate (3-5 cells long) hair crowned by a small swollen oblong terminal cell and bearing many marginal hairs similar to apical region of palea. Fronds spirally arranged, not crowded (*ca* 10 mm apart), subdimorphous. Sterile fronds with stipe 30-70 cm long, profusely paleaceous at base (paleae larger than those on rhizome and some ± boat-shaped) and sparsely so upwards but glabrous at maturity, erect to oblique, adaxially grooved, pale green but becoming copper-brown at base, and having many scattered sclerenchyma strands in the basal region. Lamina 40-70 cm long, deltoid-ovate, 1-pinnate having 3-6 pairs of subopposite simple petiolate (petiole up to 13 mm) lateral pinnae and a terminal one which is similar but larger; pinnae 25-40 × 5-8 (-10) cm, elliptic-oblong, subfalcate and with smooth margin, broadly cuneate base (basiscopic base broader) and with long acuminate apex; basal pair of pinnae broader on basiscopic base but never lobed; terminal pinna ovate-elliptic, not falcate, with symmetrical and usually rounded base; lamina of very young plants simple, resembling the large terminal pinna of adult plants but larger ones having deeply cordate base. Lamina subcoriaceous, becoming olivaceous brown when dry and nearly glabrous on both surfaces but for a few small uniseriate hairs on upper surface of midrib. Venation reticulate with midrib protruded on both surfaces; main lateral veins 10-15 (-20) mm apart, at 60-70° with midrib, raised on lower surface, prominent nearly up to margin, bearing 5-7 (-10) slender zigzag spreading lateral veinlets (basiscopic basal one originating from or close to midrib) at 3-8 mm intervals alternately on either side and each ± arcuately interconnected with the next anterior one to form large trapeziform primary areoles which are divided by zigzag veinlets into 2 or 3 secondary areoles enclosing a much branched free veinlet with divergent branches. Fertile fronds seasonal, usually not much different from sterile except for slightly longer stipes but often having narrower lamina. Sori superficial, seated close to base on the primary branch of each main lateral vein (thus forming 2 rows of 5-10 sori between each pair of main lateral veins), commonly circular and 2.5 mm across, devoid of indusium and often evident on upper surface. Sporangia with annulus 11-13 cells long and stalk bearing 1-4 short papillate hairs (2 or 3 cells long). Spores 22 × 34 × 23 μ and planoconvex to concavoconvex in lateral view; exine 2 μ thick, light brown, smooth and enveloped by a closely adherent brown perine wrinkled into ridge-like folds which form pentagonal reticulae (5-6 μ across) bearing a slender sharp spine (5-6 μ tall) at each corner.

T. macrocarpa is rather wide spread in the Malabar area, being abundant throughout Wynad, Silent Valley, Attappady and Nelliampathy. Beddome (1864) who first reported this South Indian fern initially regarded it as a variety of *T. polymorpha* (Wall.) Copel., but later (Beddome, 1883). abandoned the varietal status, relegating it as a minor varient only. Obviously, only gross resemblance in frond morphology was taken into account by him and detailed morphology ignored. During the present study both the taxa were observed both in the field and under experimental cultivation for over 10 years; it was found that they maintain their identity and morphological differences through generations even when raised from spores. In general appearance the pinnae and fronds of both are much alike, but *T. macrocarpa* differs from *T. polymorpha* in having (i) elongated, comparatively slender, distinctly creeping rhizome in contrast to the erect short thick rhizome of *T. polymorpha* (Holttum, 1954; Sledge, 1972); (ii) all lateral pinnae including the basal pair invariably simple and entire in contrast to basal 1 or 2 pairs bifurcate in *T. polymorpha;* (iii) comparatively large exindusiate sori as against small indusiate sori of *T. polymorpha;* (iv) sori restricted to secondary veins and one per secondary vein (not necessarily on netted veins) and thus two rows between costules as against a row of sori on either side of secondary vein and thus several rows between costules, being seated on tertiary veins; (v) spores resembling those of *T. semipinnata* (Wall.) C.Chr. in having a closely adherent perine wrinkled into thin ridges which form a reticulum having a large spine at corner of meshes, in contrast to spores of *T. polymorpha* which have a loose spinulose perine wrinkled into elongated ridge-like folds (Devi, 1977; Nayar and Devi, 1964).

3. **Tectaria periya** Nayar et Geevarghese sp. nov.

Tectaria coadunatae similis sed multo largior. Lamina deltoida, tripinnato-quadripinnatifida; pinnae primariae 6-8 pares. Lamina glabrosa in superficie ventrali, sed pilosa (pili 200-250 μ longi) in superficie dorsi; glandulosi pili absunt; pili in venis tantum 60 μ longi; in superiore superficie mediae costae 300-350 μ longi sed multo brevisus (130-150 μ longi) in inferiore superficie. Indusia glabra. Sporae *ca* 30 × 43 × 30 μ in magnitudinae cum spinulosae perine.

Type: No. K 11691 collected by B. K. Nayar at Periya, Wynad (850 m) on 15-2-1982 and deposited at CAL. Duplicate deposited at CALI. Paratype: No. K 10695 collected by B. K. Nayar at Periya on 22-1-1981 and deposited at CALI.

A large terrestrial fern resembling *coadunata,* forming small clumps on steep semi-exposed slopes in Ghat areas at *ca* 850 m altitude. Rhizome short, creeping, 4-5 cm thick, epigeal and clothed by tufted roots, somewhat swollen leaf bases and basally attached, dark brown paleae which are 10 × 2 mm, lanceolate with faintly cordate broad base and narrowed upwards to an elongated uniseriate apex crowned by a small subglobose glandular terminal cell and bearing several slender thin-walled elongated gland-tipped uniseriate marginal hairs pointing backwards; unicellular thin-walled papillate hairs having an extracellular cap-like secretion occur scattered all over margin and even on the multicellular marginal hairs. Fronds large (nearly 2 m long), more or less tufted, with stipe obliquely erect and lamina spreading. Stipe 70-90 cm long, *ca* 8 mm thick (basal *ca* 4 cm region up to 15 mm thick), shallowly grooved adaxially, brownish green when fresh and densely paleaceous at base, some of the paleae being large (10-13 × 3-4 mm) and blackish brown. Lamina *ca* 110 cm long, as much or a little more broad, tripinnate-quadripinnatifid, deltoid in outline and bearing 6-8 pairs of lateral pinnae anterior to which a 20-25 cm region is pinnatifid. Basalmost primary pinna largest, subdeltoid, *ca* 70 × 35 cm, bearing 6-8 pairs of secondary pinnae and an elongated pinnatifid anterior region; others bearing only 4 or 5 pairs of secondary pinnae Secondary pinnae pinnate, the basal basiscopic one of basal primary pinna largest, *ca* 30 cm long and bearing 2-3 pairs of alternate tertiary pinnae, the basal ones of which are short stalked, narrowly oblong, *ca* 9 × 2.5 cm, and with nearly rounded base, short acuminate apex and margin lobed half way down into oblong lobes (4-7 × 5 mm) having bluntly rounded apex and entire margin. Texture of lamina thin and herbaceous; hairs absent on lamina on lower surface but upper surface bearing sparse stiff stout brown hairs (200-250 × 30-40μ) tapered to a blunt non-glandular apex, usually 4 cells long and with thickened cross walls; midrib of lobes and main lateral veins hairy on both surfaces, the hairs dense, tapered to an elongated non-glandular apex and those on the upper surface light brown, thin-walled, 300-500 × 35-45μ, and with thickened cross walls while those on the lower surface much smaller, commonly 2-3 cells long and 130 × 25μ but some of them even unicellular and papillate; the smaller veins bear on both surfaces sparse erect stiff small (1 or 2 cells long, 60 × 20μ) hairs tapered to a blunt nonglandular apex. Venation similar to that of *T. coadunata* but with the areoles larger and mostly having a simple unbranched free included veinlet. Vegetative buds absent on fronds. Fertile fronds similar to sterile ones. Sori restricted to ultimate lobes of lamina, superficial, evident on upper surface, seated on the free-ending first tertiary branch of each secondary veinlet, forming one row on either side of midrib of lobes, large (over 2 mm), spreading a little down the tip of fertile veinlet and covered by an orbicular indusium (which does not fully cover the mature sorus) attached by base as well as sides of the auricle-like basal region (attachment region a little elongated over fertile veinlet), devoid of hairs and with entire margin. Spores monolete, 30 × 43 × 30μ and planoconvex in lateral view; exine light brown, 2.5 μ thick, densely spinulose (spinule blunt, 1.5 μ); perine loose, hyaline, spinulose (spinule sharp, up to 2 μ) and wrinkled into many thin lobe-like folds forming an irregular reticulate pattern.

T. periya has been collected from only the Periya area of Wynad where it is rather abundant. It is similar to *T. coadunata* but differs from it in characters listed in Table-I.

4. **Sphaerostephanos wynadensis** Nayar et Geevarghese sp. nov.

Species e grege *Sphaerostephanos subtruncato* aliquatum similaris praeter differt — paleae angustae et glanduloso pilis; frondibus amplus, longus; pinnis basalibus reductis 20-30 jugis; inferior superficies laminae, costulae, costae, rachisque et sporangiorum capsulis portatio globosus glandulosus aurantiacisque pilis; venae lateralis in lobis 8-12-jugatis; sporangiorum stipes nudus et sporae *ca* 36 × 55 × 38μ in dimensione.

Type: No. CU 29250 collected by K. K. Geevarghese on 13-2-1980 at Attappady (850 m) and deposited at CAL. Duplicate deposited at CALI. *Paratype* : No. CU 17982 collected by K. K. Geevarghese at Vythiri Wynad (700 m) on 24-2-1979 and deposited at CALI.

S. wynadensis is a large terrestrial fern of shaded semimarshy localities on banks of perennial streams near the edges of forests. Rhizome epigeal, trunk like, 3-5 cm thick, 15-25 cm tall, unbranched, possessing many slender black sclerenchyma strands scattered in ground tissue and clothed by large, light brown, thin-walled paleae which are 7-10 × 2.0-2.5 mm, narrowly ovate-lanceolate with deeply cordate base and an acuminate uniseriate apex crowned by a prominently swollen (*ca* 60 μ across) glandular cell, and bearing unicellular globose thin-walled glands as well as erect small acicular hairs superficially and marginally; in addition a few elongated uniseriate glandular hairs occur marginally. Fronds forming a tufted crown and bearing all over unicellular acicular hairs, unicellular pale-yellowish globose sessile glands and capitate unicellular glandular secretory hairs having a narrow short stalk and swollen subglobose to suboblong head (50-60 μ across) with a smooth shell-like orange-red to reddish-yellow hard secretion (*ca* 8 μ thick) enveloping it all around. Stipe erect, 50-70 cm long, 5-8 mm thick, tetragonal, blackish, having sclerenchyma strands scattered in ground tissue, densely paleaceous at base but sparsely so upwards, dorsally grooved, green when young but blackish at maturity (blackish-brown when dry) and bearing 20-30 subopposite pairs of auricles (3-5 cm apart) of which the basal ones are reduced to mere pimple-like aerophores while the upper ones are progressively larger, pinna-like, up to 3 cm long, oblong and with acute apex, lobed margin and a prominent strap-like basiscopic basal lobe. Lamina obliquely erect with anterior half spreading, 100-160 × 20-35 cm, oblong-lanceolate in outline, the apical region pinna-like (8-12 cm long) but having a much broader deeply pinnatifid basal half. Rachis sparsely paleaceous; acicular hairs on dorsal side prominently curved towards apex of frond (tip touching rachis) and 750-850μ long, and those on ventral surface shaggy, spreading, mostly 400-500μ long but a few larger (*ca* 700μ) and curved. Lateral pinnae many, having a small abaxial aerophore (1.0 × 0.5 × 0.5 mm) at base, spreading, rather loosely placed (3-5 cm apart near base, *ca* 2 cm apart upwards), the basal 2 or 3 pairs slightly shorter but markedly larger than auricles on stipe; larger pinnae narrowly oblong, 15-20 × 1.5-2.0 cm, with a truncate to sub-truncate base, acuminate subentire apical region and margin lobed nearly 2/3 way to midrib into oblong-falcate lobes (6-8 × 3-4 mm) having bluntly acute apex and entire margin bordered by a narrow cartilaginous reflexed edge; sinus between lobes narrow with sinus membrane short and convex on lower surface; up to 4 cm length of basal region of a few basal pairs of pinnae markedly narrowed (to half the width of pinna) and less lobed. Lamina thin, herbaceous; on upper surface hairs occur densely over midrib and sparsely over veins but lamina inbetween devoid of hairs; entire lower surface profusely dotted with globose sessile glands and capitate secretory hairs and in addition the midrib, veins and cartilaginous margin and sinus membrane bear spreading curved large acicular hairs. Midrib and veins raised on lower surface; midrib grooved on upper surface with groove interrupted at base. Main lateral veins *ca* 6 mm apart, bearing 8-12 pairs of oblique, simple, subopposite lateral veins of which the basal pair unites at a broad angle bearing an excurrent veinlet which merges with base of sinus membrane; the next lateral vein on acroscopic side unites with the excurrent veinlet but that on basiscopic side and the third on acroscopic side extend to the anterior end of the sinus membrane and skirt it or may end at the base of sinus; all other lateral veins end at the cartilaginous margin of the lobes away from sinus. Fertile fronds similar to sterile ones but lamina of highly fertile pinnae often a little narrower. Sori medianly placed on all lateral veins, nearly circular or slightly elongated; occasionally sori on the united basal pair of veins close to each other or more often confluent. Indusium bearing many capitate secretory hairs and globose glands, and an occasional acicular hair on surface. Annulus 13-15 cells long; a capitate secretory hair is borne on capsule next to annulus on one side; sporangial stalk devoid of hairs. Spores bilateral, 30 × 46 × 30μ (swelling to 36 × 55 × 38μ on acetolysis), planoconvex to concavoconvex in lateral view; exine golden brown, 2 μ thick, smooth and enveloped by a skin-like light brown perine bearing dense spinules (3 μ tall, sharp) and faintly wrinkled into short thin folds; a supralaesural fold extends from end to end of spore (Table – II).

S. wynadensis is rather common in the Vythiri area of Wynad and is found also at Attappadi. It is similar to *S. subtruncatus* and in spite of its more robust nature, characteristic black colouration of stipe and rachis and other characters mentioned in Table - II, could have been regarded as a variety of *S. subtruncatus* but for the possession of capitate secretory hairs all over the plant body and the significance attached to this type of hairs in the taxonomy of Thelypteridaceae. Holttum (1971) who recently brought to the fore the taxonomic significance of such secretory foliar hairs maintains that they are restricted to the genus *Christella*. In contrast, sessile globose unicellular glands of the type found in *S. wynadensis* are found also on the lower surface of lamina of almost all species of *Sphaerostephanos* (Holttum, 1975, 1979) including *S. subtruncatus;* in some like *S. arbuscula* they occur on both surfaces of lamina as well as on indusia and sporangia, but in *S. wynadensis* they are far more profuse and are found also on veins, rachis and stipe. These glands are thin-walled, sessile, globose, pearl-like, scarcely having any extracellular secretion and often becoming somewhat crumpled on drying. On the other hand, the capitate secretory hairs are unique, composed of a narrow short stalk and a swollen, stiff, subglobose to suboblong head which is 50-60 μ across, not crumpling on drying and having a hard, shell-like, *ca* 8-10 μ thick, orange-red to reddish-yellow extracellular secretion enveloping it all around. No other species of *Sphaerostephanos* possess such hairs. Both *S. subtruncatus* and *S. wynadensis* occur in Wynad area and the latter is easily distinguished in the field being more robust having more or less spreading crown (anterior half of fronds obliquely spreading) and the distinctly black colouration of stipe and rachis.

Table I

Contrasting characters of *Tectaria coadunata* and *T. periya*

Character	*Tectaria coadunata*	*Tectaria periya*
Fronds	Stipe 50-80 cm; lamina 30-60 × 50-70 cm with anterior half pinnatifid and basal half 2-pinnate; basal primary pinna 15-35 × 10-15 cm, pinnatisect except for a basal basiscopic secondary pinna.	Stipe 70-90 cm; lamina 90-110 cm each way with anterior quarter pinnatifid and basal half 3-pinnate-quadripinnatifid; basal primary pinna 50-70 × 30-35 cm, having 6-8 secondary pinnae which are again pinnate.
Hair on upper surface of lamina	Sparse, 1 mm × 50-70 μ, 5-8 cells long, thin-walled, hyaline, with terminal cell of some nonglandular, elongated, tapered while of others glandular and subglobose.	Sparse, 200-250 × 30-40 μ, 3 or 4 cells long, with thickened cross walls, brown, with terminal cell, of all elongated nonglandular and tapered.
Hair on lower surface of lamina	Small, sparse, 2-3 cells long, 130 × 150 μ, with terminal cell elongated, nonglandular.	Absent.
Hair on upper surface of midrib	Dense, thin-walled, hyaline, 3-5 cell long, 250-325 × 25 μ, with elongated nonglandular terminal cell.	Dense, light-brown, with thickened cross walls, 300-500 × 35-45 μ, with elongated nonglandular terminal cell.
Hair on lower surface of midrib.	Dense, brown, with elongated nonglandular terminal cell and of two types : (a) 2-3 cell long, 225 × 25 μ and (b) 5-7 cells long, 350 × 50 μ.	Dense, brown, with elongated nonglandular terminal cell, 1-3 cell long, 130-150 × 25 μ, and with thin cross walls.

Contd. Table I

Hair on veins	1-3 cells long, 60 × 20 μ, with elongated, nonglandular terminal cell; dense on upper and sparse on lower surface.	1 or 2 cells long, 60 × 20 μ, with elongated nonglandular terminal cell; sparse on both surfaces.
Venation	Free included veinlets absent in areoles of sterile frond.	Unbranched free veinlet included in areoles of sterile frond.
Vegetative buds	Present on upper surface of fertile fronds.	Absent.
Sori	1.5-2 mm across, distributed all over lamina forming many rows on either side of midrib of lobes (2 rows between primary lateral veins); indusium circular, bearing hairs.	Over 2 mm across, restricted to ultimate lobes of lamina, forming one row on either side of midrib of lobes; indusium orbicular, devoid of hairs.
Spores	24 × 35 × 27 μ; exine granulose; perine faintly granulose, wrinkled into irregular folds.	30 × 43 × 30 μ; exine spinulose (spinules 1.5 μ); perine spinulose (spinules 2 μ), wrinkled into many irregular folds.

Table II

Contrasting characters of *Sphaerostephanos wynadensis* and *S. subtruncatus*

Character	*Sphaerostephanos subtruncatus*	*S. wynadensis*
Sclerenchyma	Few sclerenchyma strands in ground tissue, mostly restricted to pith region.	Profuse sclerenchyma strands scattered all over in ground tissue (pith and cortex).
Paleae	Elongate-ovate, 5-8 × 3-4 mm.	Narrowly ovate-lanceolate, 7-10 × 2-2.5 mm.
Fronds	120-180 cm long (stipe 40-60 cm), erect; stipe and rachis copper brown.	150-230 cm long (stipe 50-70 cm), obliquely erect with anterior half spreading; stipe and rachis black.
Auricles	Stipe bearing 13-18 pairs of which larger (upper, ones are 5-10 × 4-8 mm and having triangular lamina; devoid of secretory hairs and glands.	Stipe bearing 20-30 pairs of which larger (upper) ones are pinna-like, 20-30 × 10-12 mm, oblong with lobed margin and having prominent basiscopic lobe, globose glands and capitate secretory hairs profuse on lower surface.
Pinnae	Base broadly truncate with acroscopic base auricled and overlapping rachis; basal 10-15 mm region of basal pairs of pinnae narrowed; aerophore at pinna base prominent; acuminate apical region of pinna serrate; margin of pinna lobed 1/2 way with ultimate margin ± sinuous.	Base narrowly truncate, not auricled nor touching rachis, basal 30-40 mm region of basal pairs of pinnae narrowed; aerophore at pinna base small; acuminate apical region of pinna subentire; margin of pinna lobed 2/3 way or more with ultimate margin entire.

Contd. Table II

Foliar hairs	Acicular hairs sparse on stipe, lower surface of veins and margin, and dense on rachis upper surface of midrib and veins; lamina between veins devoid of hairs on upper surface but bearing sessile yellowish to white globose glands.	Acicular hairs dense all over stipe, rachis, veins and margin and throughout intermingled with capitate orange-red secretory hairs and globose yellowish sessile glands; lamina bearing sessile glands sparsely on upper surface and profusely on lower surface all over.
Lateral veins	Main lateral veins bearing 5-9 pairs of veinlets.	Main lateral veins bearing 8-12 pairs of veinlets.
Sori	Row of sori on either side of vein converging upwards.	Row of sori not converging.
Indusium	Devoid of sessile glands and secretory hairs.	Bearing many secretory hairs and sessile glands.
Sporangium	Capsule bearing a sessile gland.	Capsule bearing a capitate secretory hair.
Spores	24 × 40 × 24 μ, swelling to 28 × 48 × 30 μ on acetolysis.	30 × 46 × 30 μ, swelling to 36 × 55 × 38 μ on acetolysis.

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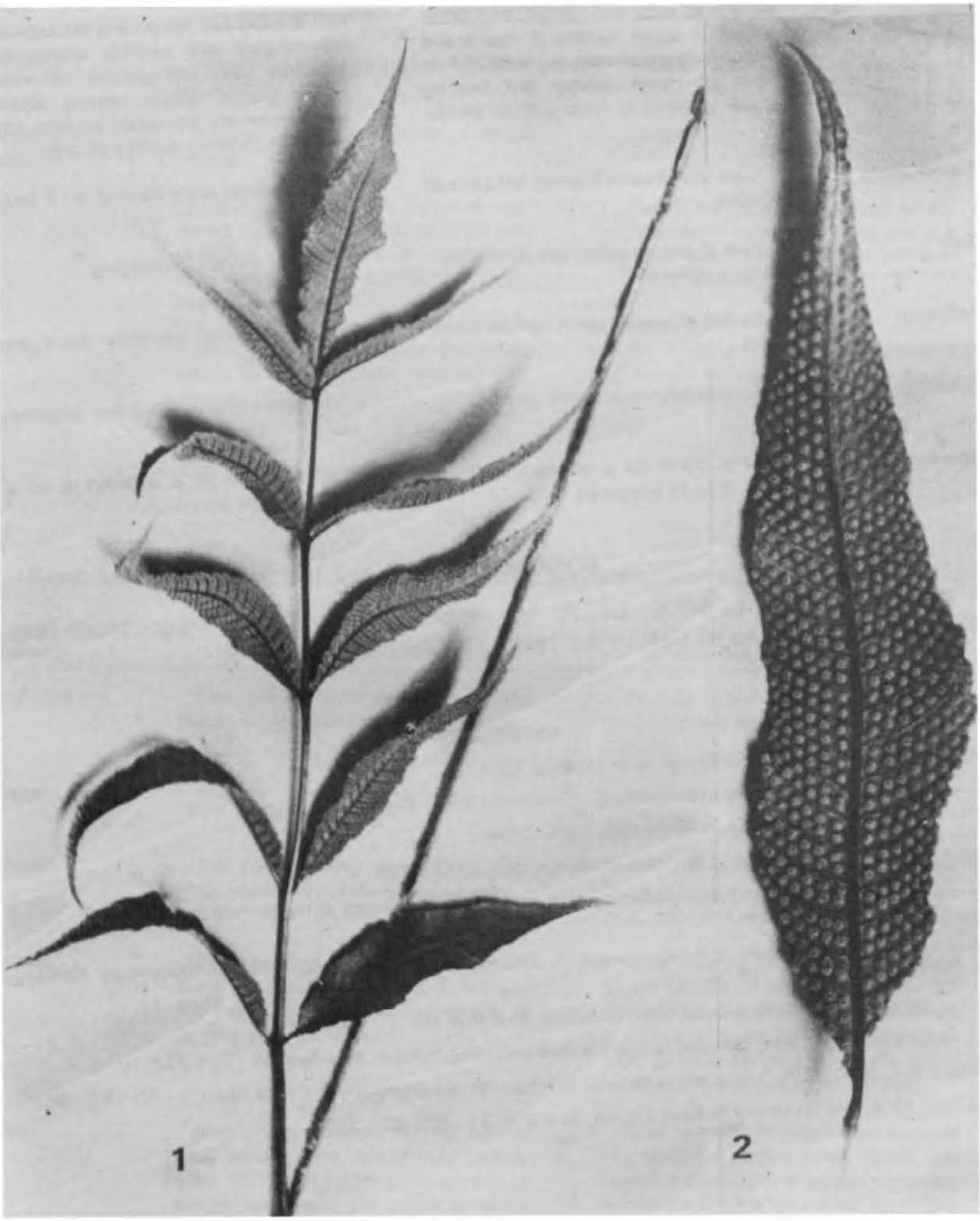
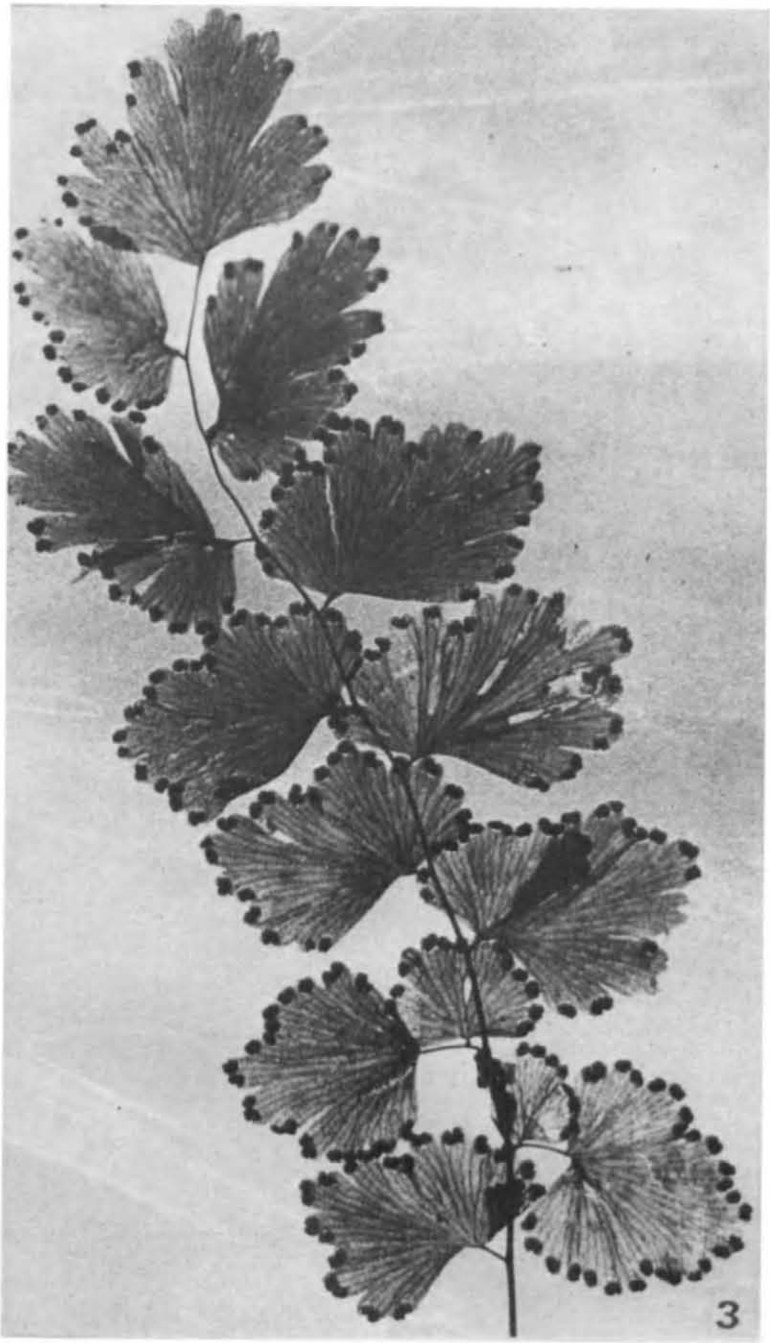
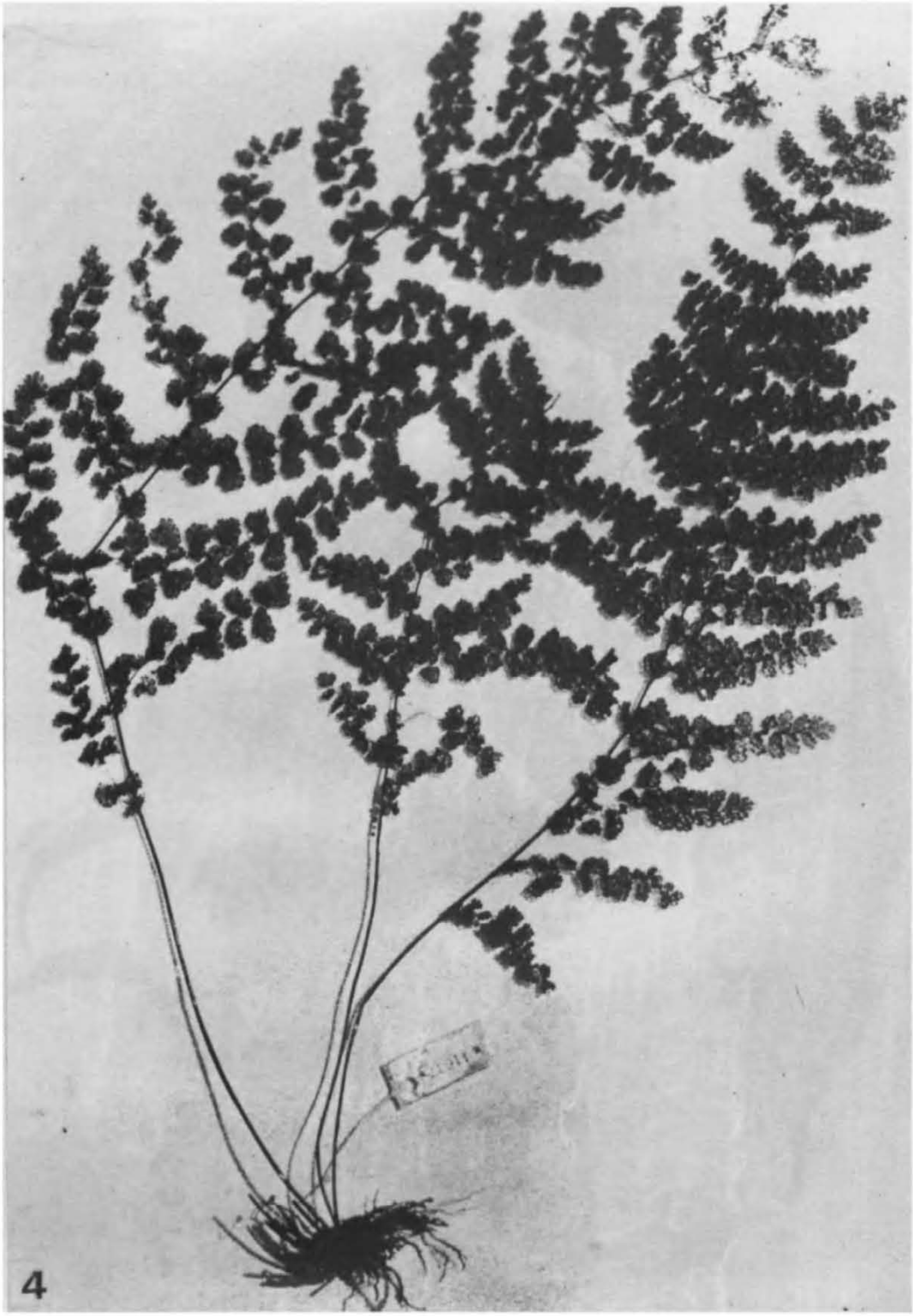


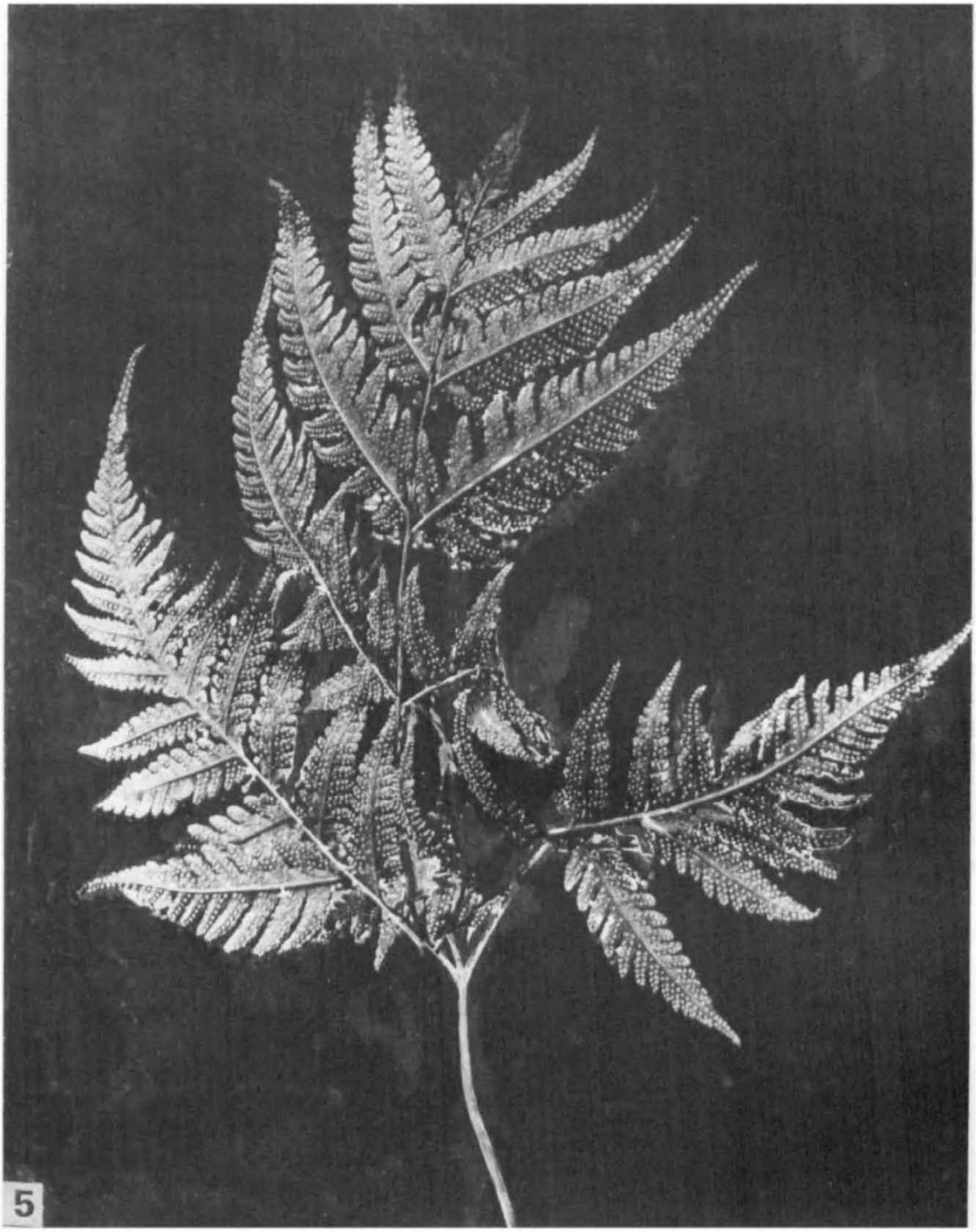
1. Fertile frond of *Tectaria macrocarpa*. 2. Lower surface of fertile pinna of *T. macrocarpa*.



3. Fertile pinnae of *Adiantum ramyam*.



4. Herbarium specimen of *A. ramyam*,



5. Fertile frond of *Tectaria periya*.